424 Rec'd PCT/PTO 0 4 AUG 2000

CERTIFICATION UNDER 37 CFR 1.10

EL620890885US	04 AUG 2000
Express Mail Mailing Number	Date of Deposit

I hereby certify that this paper or fee, and any documents referred to as enclosed herein, are being deposited with the United Sates Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Box PCT, Washington, D.C. 20231.

Cederic Rodgers	Cederic Rodgers
Name of Person Mailing Application	Signature of Person Mailing Application

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: ROY-007

U S APPLICATION NO. (if known, see 37 CFR 1.5): Not known yet 09/601712

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/GB98/02166	20 JUL 1998	05 FEB 1998

TITLE OF INVENTION: VIDEO MEDIA CONTROL SYSTEM

APPLICANT(S) FOR DO/EO/US: Kenneth AUSTIN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1);
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2));
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3));
9. ☐ An oath or declaration of the inventor(s) 35 U.S.C. 371(c)(4)) and **Power of Attorney;**
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5));

Items 11 to 16 below concern other document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98;
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment;
    ☐ A SECOND or SUBSEQUENT preliminary amendment;
14. ☐ A substitute specification and claims amended to conform the translated application to US practice;

US APPLICATION NO. (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEYS DOCKET NUMBER
09/601712	PCT/GB98/02166	ROY-007

15. ☐ A change of power of attorney and/or address letter;

16. ☒ Other items or information:
- (a) copy of forms PCT/IB/308 and PCT/IB/332;
- (b) copy of the First Page of International Publication;
- (c) copy of International Search Report;
- (d) copy of Written Opinion and Response thereto;
- (e) copy of International Preliminary Examination Report and its annexes;
- (f) separate abstract page to conform application to US practice.

17. ☒ The following fees are submitted:

	CALCULATIONS (PTO USE ONLY)	
BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $970.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $840.00		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search fee (37 CFR 1.445(a)(2)) paid to USPTO $690.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) $670.00		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT=	$840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$130.00	

Claims	Number Filed	Number Extra	Rate		
Total Claims	44	14	X $ 18.00	$252.00	
Independent Claims	5	2	X $ 78.00	$156.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $260.00		
TOTAL OF ABOVE CALCULATIONS =				$1,378.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				$0.00	
SUBTOTAL =				$1,378.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$0.00	
TOTAL NATIONAL FEE =				$1,378.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) $40 per property				$0.00	
TOTAL FEES ENCLOSED =				$1,378.00	
				Amount to be refunded	$
				charged	$

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ROY-007

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants:	Kenneth AUSTIN	
Serial No.:	Not yet known	Examiner: Not yet known
Filed:	August 4, 2000 (by Express Mail)	
International Filing Date:	July 20, 1998	Art Unit: Not yet known
International Serial No.:	PCT/GB98/02166	
For:	VIDEO MEDIA CONTROL SYSTEM	

09601712 - 080400

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231
Box: PCT

Sir:

This communication is submitted in advance of prosecution on the merits of the above identified application. The application is based on the specification and claims of the published application, as amended in response to the Written Opinion (amended claims pages 35-43 of the letter of March 20, 2000) and upon which the International Preliminary Examination Report is based, a copy of which is being concurrently filed herewith. Please amend this application as follows.

IN THE SPECIFICATION:

On the International Application as published, amend the specification as follows:

On page 1, after the title, delete the heading "DESCRIPTION" and insert the subtitle --Technical Field-- in its place.

On page 1, between line 3 and line 4 of the text (after the first sentence and before the first full paragraph), insert the subtitle --Background of the Invention--.

On page 2, between line 12 and line 13, (before the second full paragraph) insert the subtitle --Summary of the Invention--.

On page 19, between line 7 and line 8 of the text, insert the subtitle --Brief Description of the Drawings--.

On page 20 between line 12 and line 13 of the text, insert the subtitle --Detailed Description of the Drawings and Preferred Embodiments--.

IN THE CLAIMS:

In Amended Sheets 35-43 of the Claims upon which the International Preliminary Examination Report is based, amend the claims as follows:

On Amended Sheet 35, claim 1, line 10, delete "the" and substitute therefor --a--.

On Amended Sheet 35, In claim 4, line 1, delete "claims 1, 2 or 3" and substitute therefor --claim 1--.

On Amended Sheet 36, claim 5, line 1, delete "anyone of claims 1 to 4" and substitute therefor --claim 4--.

On Amended Sheet 36, claim 7, line 1, delete "anyone of the preceding claims" and substitute therefor --claim 6--.

On Amended Sheet 36, claim 8, line 1, delete "anyone of claims 5, 6 or 7" and substitute therefor --claim 7--.

On Amended Sheet 36, claim 10, line 1, delete "anyone of claims 5 to 9" and substitute therefor --claim 9--.

On Amended Sheet 36, claim 11, line 1, delete "anyone of the preceding claims" and substitute therefor --claim 10--.

SUBSTITUTE SHEET (RULE 26)

On Amended Sheet 36, claim 12, line 1, delete "anyone of claims 5 to 11" and substitute therefor --claim 11--.

On Amended Sheet 37, claim 15, line 1, delete "anyone of claims 5 to 14" and substitute therefor --claim 14--.

On Amended Sheet 37, claim 18, line 1, delete "claims 16 or 17" and substitute therefor --claim 17--.

On Amended Sheet 37, claim 19, line 1, delete "claims 17 or 18" and substitute therefor --claim 18--.

On Amended Sheet 37, claim 20, line 1, delete "anyone of claims 1 to 19" and substitute therefor --claim 19--.

On Amended Sheet 38, claim 21, line 1, delete "anyone of claims 1 to 19" and substitute therefor --claim 19--, same claim, line 6, delete "direction" and substitute therefor --directly--.

On Amended Sheet 38, claim 23, line 1, delete "anyone of the preceding," same claim, line 2, delete "claims" and substitute therefor --claim 22--.

On Amended Sheet 38, claim 24, line 1, delete "anyone of the preceding," same claim, line 2, delete "claims" and substitute therefor --claim 23--.

On Amended Sheet 39, claim 25, line 1, delete "claims 21, 22 or 24" and substitute therefor --claim 24--.

On Amended Sheet 39, claim 26, line 1, delete "anyone of claims 21 to 25" and substitute therefor --claim 25--.

On Amended Sheet 39, claim 27, line 1, delete "anyone of claims 21 to 26" and substitute therefor --claim 26--.

SUBSTITUTE SHEET (RULE 26)

On Amended Sheet 39, claim 28, line 1, delete "anyone of the preceding," same claim, line 2, delete "claims" and substitute therefor --claim 27--.

On Amended Sheet 39, claim 29, line 1, delete "anyone of the preceding," same claim, line 2, delete "claims" and substitute therefor --claim 28--.

On Amended Sheet 39, claim 30, line 1, delete "anyone of the preceding," same claim, line 2, delete "claims" and substitute therefor --claim 29--.

On Amended Sheet 40, cancel claims 33-35 without prejudice.

On Amended Sheet 41, claim 38, line 1, delete "36 or 37" and substitute therefor --claim 37--.

On Amended Sheet 41, claim 40, line 1, delete "anyone of claims 1 to 19" and substitute therefor --claim 19--.

On Amended Sheet 42, claim 42, line 1, delete "claims 40 or 41" and substitute therefor --claim 41--.

On Amended Sheet 42, claim 45, line 1, delete "43 or".

On Amended Sheet 43, claim 46, line 1, delete "claims 43," same claim, line 2, delete "44 or 45" and substitute therefor --claim 45--.

IN THE ABSTRACT:

Submitted herewith as a separate page is the Abstract containing the subject matter (without numerals) of the Abstract in the published International Application, WO 99/40587.

REMARKS

Claims 1-32 and 36-47 are pending in the application. By this Amendment, the headings have been added to the specification and the claims have been placed in better form for United States practice.

SUBSTITUTE SHEET (RULE 26)

The foregoing amendments are submitted in advance of prosecution so as to expedite the prosecution of this application. Early and favorable consideration on the merits is solicited.

Respectfully submitted,

August 4, 2000

By _____
Michael A. Hierl, Reg. No. 29,807

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SUBSTITUTE SHEET (RULE 26)

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CERTIFICATE OF EXPRESS MAILING

"Express Mail" mailing label number EL620890885US

Date of Deposit: August 4, 2000

I hereby certify that this PRELIMINARY AMENDMENT was deposited with the United States Postal Service "Express Mail Post Office to Addressee" under 37 C.F.R. 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Box PCT, Washington, D.C. 20231.

Michael A. Hierl

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09/601712

Title: Video Media Control System

DESCRIPTION

The present invention relates to a video media control system to control a video media storage device be it for tape or other storage media, and to the storage and retrieval of information recorded on a video storage media.

Magnetic tape storage devices are widely used for recording audio and video signals. When recording programme material of this type the running time is usually known and it is possible to estimate the amount of recording time on a tape by noting the physical position of the tape. Even so, when multiple sets of programme material are recorded on one tape the ability to locate a specific programme is limited. Some index search facilities enable the commencement of each new recording event to be located, but otherwise location of any particular recording has to be a matter of trial and error, perhaps using the tape counter as a guide to the location of the desired material as it provides only a indirect and approximate measure of tape position.

This contrasts markedly with the indexing provisions which are possible with disks storage mediums. These are able to provide a directory of the disk contents as well as information identifying the exact location of a particular item on the disk, the amount of space taken up by that item and the amount of space available for recording new data.

The likes of a video cassette as used in a video cassette recorder has the capacity to store large quantities of data - be it picture component or data when correctly formatted, but the above mentioned difficulties in connection with the

subsequent location of selected ones of multiple sets of recorded material and the difficulty of ascertaining the amount of recording space remaining on a tape make tape storage systems inconvenient to use. The position is further complicated when data signals are to be recorded as video cassette recorders will not necessarily be able to accept the same data rates. I.e. the encoding of the data to suit the bandwidth of the VCR may require different amounts of tape depending on the number of lines and/or frames that the information is spread over.

It will be apparent from the above that the problem with video tape as a storage medium for multiple sets of information is that there is no electronically readable index providing information as to what is on the tape, where it is located and how much of the tape is available for recording. The present invention aims to provide a solution.

Accordingly, one aspect of the present invention provides a tape control system comprising means operable to control a tape storage device, said means including means for determining tape position based on data received from a tape reading means, which data has previously been encoded onto the tape.

Such a system enables individual selection and retrieval of multiple sets of recorded data and signals. Means is provided for encoding the data which may comprise time code or other data which is encoded onto the tape at periodic intervals by a tape recording means. It is preferred that the data is recorded during the recording of the tape. The recorded data may alternatively or additionally record frame number, total frames and session name. For convenience such recorded data is hereinafter referred to as a data index. The data indexes are recorded at periodic

intervals along the tape in such a way to facilitate reading by the playback head of a tape recorder at least during play back. Analysis of the data will determine the position of the tape directly from the tape rather than indirectly from a tape counter. Typically the data indexes are written every second or fraction thereof.

The present invention has application to any tape storage system but one particular application is to the control of a video tape and for ease of reference the invention will be described further hereinafter in relation to such hence the reference to the like of Video Cassette Recorder (VCR), video tape and Television screens. It is preferable for the data to be recorded at positions on the tape corresponding to the Vertical Blanking Interval.

The tape control system is controlled using an infra-red control signal. Existing infra-red controls only permit tape control in respect of playback, fast forward, fast rewind, record and basic index searching. By reading tape position data direct from the tape, it is possible to locate specific positions on the tape.

Where the data index is readable only on playback, the fast forward and fast rewind characteristics of the video cassette recorder are advantageously assimilated (hereinafter referred to as characterisation data) by the control means i.e. the tape velocity and acceleration rates are reviewed so that the controller can compute the length of tape which will be processed in a particular time and can operate the fast forward rewind of the tape for the appropriate time to reach the desired tape position. When the recorder switches to playback the next data index which is read will enable the controller to determine whether any further fine positioning adjustments are required. Once the characterisation data of a video recorder is known the desired

position can be arrived at quickly once the current tape position is known. The characterisation data may be derived from a code produced by the VCR manufacturer so avoiding the need for the characterisation data assimilation techniques. Advantageously means is provided for issuing infra-red command sequences to automatically reposition the tape to a selected desired position utilising characterisation data determined for said tape storage device.

Determination of characterisation data for the VCR as concerns for example fast forward and rewind characteristics can be accomplished by operating the VCR in fast forward and rewind modes as the case may be at the beginning and end regions of the tape for prescribed intervals of say 5 seconds, 10 seconds and 20 seconds and using the noted data index values to produce a performance curve from which the time of operation can be correlated with tape position for the whole length of a tape.

The desired position is selected having regard to an index of material recorded on the tape which index provides information identifying the nature of the recorded material and its position on the tape. Such information (file data) is conveniently referred to as a file index or a file allocation table (hereinafter referred to as a FAT) and may be stored externally to the tape as well as on the tape. More particularly each recording session terminates with the recording of a file allocation table. The successive file allocation tables are cumulative. The information identifying the position of a particular item may comprise a note of its start and end positions or one of these and its length, in terms of say frame number, a time or any combination of same. Such information is stored in memory from data read from the tape and/or input by the user. For example programming software is employed to

provide control menus to be read on a T.V. screen and/or a display on the infra-red handset from which VCR control options can be selected including still video fraames or sequences, titling of the tracks for indexing purposes and control of the recorder in relation to recording T.V. pictures, data transmitted with the T.V. pictures and pure data, or any combination thereof.

Accordingly another aspect of the invention comprises recording a file index on storage tape which file index relates to the contents of the tape.

The tape contents may comprise one or more sets of signals or data. This aspect of the invention further comprises recording data associated with the position on the tape of the set or sets. More particularly, multiple copies of said file index or file allocation table (hereinafter referred to as a FAT) are stored on said storage tape in different locations. This enables quick recovery of the index data. More particularly still, a new FAT is written to said storage tape when a new signal or data (recorded material) is appended to the tape. It is particularly convenient if each new FAT contains not only data related to the newly recorded material but also data relating to all the previously recorded material on the tape so that the successive FATs are cumulative. Thus each successive index will be of increased size. To facilitate creation of such a FAT, means is provided for reading and memorising the contents of the FAT immediately preceding the newly recorded material. The reading of the information is performed by the VCR playback head. Programming means is conveniently incorporated to control tape movement to facilitate reading into memory of the last FAT if not already present in order to facilitate adding to the subsequent FAT. Accordingly a separate storage means is provided for holding a copy of the

FAT as well as means which is operable to read copies of the FAT stored in said separate storage means.

The data retrieved from a tape and the associated programme control circuitry is used to determine how much unused tape is available for storage of new signals or data. Furthermore the programme control circuitry is used to select which existing signals or data can be over written in order to provide sufficient storage for new signals or data. Conveniently an on screen menu is provided and/or a hand set display.

It will be apparent from the foregoing that the provision of the frame identification code makes it possible to identify a particular location on the tape and that this, in turn, makes it possible to locate a particular item recorded on the tape using tape control system. In the case of the above described embodiment the automatic tape control system relies on tape positioning information which is read from the tape. However, it will be appreciated by one skilled in the art that the proposals contained herein for an automatic tape control system are equally applicable to controlling tapes which do not have specific tape position data recorded thereon but where tape position can nevertheless be determined. This would enable the tape control proposals to be applied to previously recorded tapes which do not have tape position information recorded thereon. By this means the tape can be moved backwards and forwards until the desired location is found. Thus the system can be used for pre-recorded tapes.

Furthermore, one skilled in the art will appreciate that the invention is not to be limited in its application to a tape control system, but is equally applicable to the

control of other types of video storage media be they magnetic or optical - such as digital versatile disc.

Accordingly, there follows a description of how video material can be identified, especially frames of a video tape but without limitation to same, without requiring identification data to be physically recorded on the video storage media. Also described is a means which enables automatic cataloguing and indexing of pre-recorded video media be it tape or other video storage media and a means of automatic identification of a video storage media from a plurality of media.

The video storage media is identified having regard to the contents thereof, be it the visible content, the audio content or close caption data or other data or signals recorded on a video media. Any of said contents may be used to generate a data sequence for identifying the video storage media and its contents.

More preferably the contents of a video frame are used to generate a frame value which is stored in a memory. The analysis of the frame contents can take place in playback mode in the case of a pre-recorded video storage media or during recording of the video storage media. By repeating the analysis for all the frames of the video media or, less preferably a sequence of frames at known intervals, a series of frame value sequences can be created and stored in memory. The analysis of any one frame may not result in a unique value, but the analysis of a sequence of frames is less likely to be repeated. It is intended that the sequences are correlated to particular events on the storage media by a user or more preferably automatically as described further hereinafter.

On a subsequent reading of the video storage media, at any given position

corresponding frame value sequences can be obtained using the same method as that used to create the frame value sequences in the first instance. The frame value sequence obtained at that particular position of the video storage media can then be compared with the frame value sequences stored in memory. This should result in a match and thereby identify the video storage media, its contents and the current position of the storage media. It is assumed that there will be some recorded frames to permit identification. Once the current position is known the storage media can be positioned at a desired location using an automatic control programme as described hereinafter.

The invention is applicable to any medium in which can be used to store video, be it magnetically or optically. Currently the most popular medium is video tape but the likes of Digital Versatile Disk (DVD) are gaining popularity. The references hereinafter to tape refer to one particular application but are not to be taken as limiting.

The above mentioned data sequence is combined with position information and/or picture and/or text and/or data or other information.

The data sequence or signal derived from and related to the contents of a video storage medium (hereinafter referred to as a related off-media data sequence) can be used to determine the position and/or the contents of the video medium. By generating at least one data sequence from the content of video storage medium and comparing the resulting data sequence with a series of data sequences stored in memory that video storage medium can be identified if a match is found or a relationship is established.

An index of video storage media contents is conveniently stored in electronic memory or on video storage media, A preferred index comprises plurality of images corresponding at least in part to the contents of the video storage medium at different positions thereof. It is particularly convenient if the index is adapted to be read and displayed on a television screen.

Another aspect of the invention provides a method of accessing material recorded on a video storage medium comprising recovering from memory an index of the storage medium contents and displaying on a television screen in the form of a plurality of images corresponding to different positions of the storage medium, with or without accompanying text, each image having associated positioned information, be it a data sequence or information relating to data written to the media during record; wherein selection of one of the images instigates a search for the corresponding position on the video storage medium preferably by determining the current position of the medium and comparing the location thereof with the location of the selected position and instigating operation of the video player transport according to programmed control to locate the desired position.

A video frame comprises an array of pixels each having a particular value which will create the overall frame image. Whilst all of these pixels could be used to generate a frame value for example by thresholding the individual pixels and summing the result, this could be susceptible to VCR tracking artifacts at the top or bottom of the video image. Accordingly, we propose to select a reduced number of pixels and these may be from a discrete array within the overall array or from discrete positions within the overall array. For example our preferred proposal is to ignore the top 50

and bottom fifty video lines. The remaining area will be divided into blocks of pixels. Each 20 x 20 block contains 400 pixels, a value is computed for each block by summing all 400 pixels then dividing by 400, the resulting value for each block will be compared with the corresponding value from the previous video frame. The block that is most different from the corresponding position in the previous frame will be the block chosen to represent the current frame, its difference value and X, Y co-ordinates are stored in a memory means. This operation is continued for a sequence of frames thereby creating a frame value sequence. The resulting frame value sequence is stored in memory.

In relation to correlating frame value sequence with tape contents it is preferred that as the analysis of the frame contents is taking place to generate the frame value sequences, the actual contents of some of the frames are stored in memory. The contents stored will preferably include the visual content of at least one frame. More preferably a sequence of frame images are stored in memory. Optionally the associated audio signal is also stored. The frames which are stored are conveniently selected automatically during the analysis at spaced intervals throughout the duration of the tape - say every 5 minutes. By this means a sequence of frames representing a short snap-shot of the content of the tape at each of these positions is stored in memory. The snap-shot need only be a few seconds long or may be a single still video frame. All snap-shots or still images are preferably stored in memory to enable a plurality of them to be simultaneously displayed on a television monitor. Programming software is provided to achieve this. A remote hand set provides a convenient means of selecting available options from an on-screen menu,

including the facility to review the associated sequence of frames stored in memory or to commence viewing the video at a position corresponding to the image displayed. This is achieved by an automatic playback facility which utilises the above described frame analysis to compare the current position of the video tape with the desired position (corresponding to the frame value sequence assigned to the selected frame) and operate the video cassette transport preferably using the I/R control commands under programmed CPU control to operate fast forward, rewind and play modes until the desired location is obtained. The preferred operation is in conjunction with VCR characterisation data discussed in our earlier application in relation to utilisation of tape position information to achieve automatic tape control.

The resulting lead image for the plurality of snap-shots of a tape will provide the viewer with an overview of the entire contents of the tape. The images may occupy more than one screen depending on the length of the tape and the frequency of the images. Forward and back commands are available to review all the recorded frames of the tape in question. By taking the snap-shots at regular intervals the viewer can assess the duration of any particular item and the space available for recording other items. For a tape of three hours duration - snap-shots every 5 minutes may be deemed sufficient. The programming software and associated options menu may allow the user to add text to the images - for example content related information such as a title - or optical character recognition (OCR) software running on the CPU can be employed to automatically extract program information from the video images. If only part of the tape has been recorded, the frame analysis procedure will identify unused tape portions. This allows the system under direction

of the user to advance the tape to an unrecorded location to commence a new recording. More preferably the programming menu provides for sections of tape which are blank or which can be recorded over, to be marked permitting an auto record function. The associated control circuitry can use the frame position information to compute the duration of any recording and the space available for subsequent recording.

Providing a visual representation of the tape contents provides a better system for cataloguing the video contents. The cataloguing and indexing of pre-recorded video cassettes can be done automatically. After analysis, pictures, text and data related to the video media contents are preferably automatically written to a memory means. Said data preferably includes the amount of blank media available for recording new material.

Existing set top boxes allow electronic programming guides to be imported and the information to be displayed on screen. Some programming options also allow the user to mark programs of interest and the software will generate a reminder, usually an on-screen reminder, so that the user can change to the appropriate channel. Other systems will automatically trigger actuation of a video cassette recorder. However, the user has to ensure that a tape is in place and that it is in a suitable place for recording to commence, i.e. to ensure that there is sufficient space for the intended recording without recording over any material of interest.

By utilising the tape position information and the indexing instruction and associated programming software and in conjunction with the imported electronic program data, the duration of a program to be recorded and the available space, for

example as a tape, can be correlated and the viewer presented with appropriate information and if there is insufficient unrecorded space an option for recording over existing material or inserting another tape.

Accordingly another aspect of the invention provides an on-screen display of tape contents retrieved from memory and comprising a plurality of images retrieved from different portions of the tape in question and/or any text or data relating thereto.

More particularly associated VCR control circuitry operates in conjunction with tape position information determined from reading the tape and correlated with data stored in memory regarding the position of each of said images to position the tape at a position corresponding to the location of a selected one of the images. More particularly still, the memory contains information on the contents of a plurality of tapes which contents can be displayed selectively. The contents of the tape displayed may be selected manually or automatically. Automatic selection is achieved by placing a video tape in an associated VCR and reviewing a sequence of frames to generate a frame value sequence which is compared with frame value sequences stored in memory, when a match is found the relevant information is displayed.

Another aspect of the invention provides a closed loop video recorder or other media device control system for determining the status of a video recorder or other media device, consisting of the steps of, (1) issuing a play command or code or sequence, (2) verifying that signals or data are received, (3) using said signals or data or absence of signals or data to determine if said video recorder or other media device is powered on.

Preferably the closed loop control system further comprises the steps of, (1)

checking that the tape or media position is substantially unchanged from a predetermined position, (2) issuing a record command or code or sequence. More preferably still, the closed loop control system further comprises the step of verifying the signals or data received from said video recorder or other media device correspond to a selected program designated for recording.

Yet another aspect of the invention provides a system for controlling a video recorder or other media device for selective enabling and disabling of associated functions, comprising the steps of, (1) periodically assessing the presence or content of signals and/or data output from said video recorder or other media device to determine if device is operating, (2) determining if said video recorder or other media device is scheduled and/or permitted to operate at time of assessing signals and/or data, (3) if required issuing a command or code or sequence to disable said video recorder or other media device by a power off command and/or a stop command and/or a pause or other command.

Yet another aspect provides a graphical user interface adapted to display information relating to television program content and/or data content from other sources such as the Internet and video recorder or other media device content, wherein selections are made from said television program content and/or data content from other sources for recording onto video tape or other media whereby calculation of available free space on said video tape or other media is displayed and whereby if insufficient space is available for recording original selections may be modified and/or some or all or the video tape or other media contents may be selected for overwriting.

Preferably the graphical user interface is adapted to display the status of items

recorded on video tape or other media as to whether the recorded item has been viewed. More preferably the graphical user interface is adapted to display information relating to one or more video tapes or other media contents, wherein the contents of said video tape or other media is displayed either graphically (could be video frames) or texturally according to the category of the recorded material, said category could be the type of recorded material or whether the item is suitable for a particular age of viewer or whether the items have been viewed or any other criteria.

A still further aspect of the invention provides a graphical user interface adapted to display information relating to television program content and/or data content from other sources such as the Internet and/or video recorder or other media device content, wherein said display information comprises a visual representation such as a picture indicating the contents of said television program content and/or data content from other sources such ad the Internet and/or video recorder or other media device content.

More preferably the graphical user interface is adapted to display television program content information by category such as what is currently showing and/or what will be showing next and/or what is showing that day and/or what will be showing that week. Preferably, the visual representation is downloaded from the program provider and stored in memory. Preferably the graphical user interface is further adapted to filter said television program content by category of user preferences such as channel number or type of television program or other category.

A yet still further aspect of the invention provides a video recorder or other media device index generation method comprising the steps of, (1) recording a

television broadcast, (2) recording in a memory means a copy of subtitling or closed caption data, (3) using said subtitling or closed caption data to search for key words or phrases to identify a scene from one or more video tapes or other media corresponding to said key word, (4) issuing a command or code or sequence to position said video tape or other media at the scene corresponding to said key word.

Accordingly, another aspect of the invention provides a video storage media control system comprising means operable to control a video media storage device, means for determining video media position, means for identifying the contents of the video media and the position thereof, means for determining the amount of media available for recording, be it unrecorded media or any portion thereof selected as available for recording over, and means providing display of control menus from which video media storage device control options can be selected including selection of material to be recorded.

The video media position may be determined by reading position data encoded on the tape. Alternatively, the position may be determined by establishing a match or relationship between a data sequence or data value read from the media and generated from the contents of the media with data sequences or a data value stored in memory for one or more video media, said data sequences or data value being generated by reading the contents of the tape and said data sequences or data value being combined with position related information. Once a method has been established for obtaining position information , be it by the described methods or otherwise, the information so obtained is used in conjunction with means which facilitates automatic control of the video media storage device transport function to locate a desired position on the tape.

Where the device forms part of a set top box or is used in conjunction with same, or other means which facilitates importing an electronic program guide, selection of material to be recorded can be selected from the guide and the programming determines whether there is sufficient space on the video medium to accommodate the selections. The program control circuitry provides the user with the option to record over part or all of the existing material or to insert another video storage medium.

It is preferred that once the video medium has been identified, the contents are displayed on screen. More preferably the contents are displayed as a plurality of images which comprise a sample of the contents of the video medium at periodic intervals. More particularly still, a plurality of said images are displayed on screen simultaneously. The contents are stored in memory and each periodic image may have associated with it a sequence of images which correspond to the recorded video images, usually those immediately preceding that main or lead image. Those associated images are also stored in memory and can be selectively reviewed by the user. Associated audio signals may also be recorded in memory. More particularly, a user is able to select a playback mode commencing from a position corresponding to any of the displayed images, whereupon the program control circuitry operates the video medium transport functions to automatically locate the correct location on the tape making use of position information and any characterisation data for the video media storage device.

Another aspect of the invention provides a video storage media control system comprising means operable to control a video media storage device, means for determining video position, means identifying the contents of the video medium and

displaying same, and means enabling playback selection from display whereupon the video media storage device automatically locates the desired playback location using position related information obtained by reading the tape.

The position information may be read directly from the tape or derived from the contents of the tape as described above. The contents displayed preferably comprises a plurality of images from different position of the video media as described above. More particularly the control circuitry allows associated content information e.g. visual sequences and/or audio signals stored in memory to be reviewed by the user.

Another aspect of the invention provides a video media control system comprising apparatus for controlling video media position, means for sending commands to the apparatus to instigate positioning of the video media at a desired position, which position is preferably selected from an on-screen display, and wherein the desired position is arrived at automatically by reading the video media to obtain position information. directly or indirectly, and changing the position of the video media until the desired position has been obtained.

The position may be for required for playback or record purposes. Where for playback purposes, the on-screen display may be the aforedescribed index of video media contents as retrieved from memory or from reading the tape. More particularly, according to one aspect, position information is established by establishing a match or relationship between a data sequence or data value generated from contents of the media with data sequences or a data value stored in memory for one or more video media, which data sequences or dat value incorporate position

related information. Alternatively where positioning is for record purposes the desired position may be arrived at having regard to availability of space for recording which may be determined automatically or user directed from a consideration of the video media contents. Any of the selectable provisions described herein which require video media positioning may be utilised with the above recorded video media control system. More particularly, according to another aspect, the display comprises one or more screen images of the contents of the video media.

The present invention will now be described further, by way of example only, with reference to the accompanying drawings; in which :-

Figure 1 illustrates in block diagram form circuity for implementing the present invention according to one embodiment, and

Figure 2 is a diagrammatic perspective view of a length of video tape illustrating diagrammatically the indexing provisions applied thereto according to one embodiment of the present invention,

Figure 3 illustrates in simplified block diagram of the present system.

Figure 4 is a more detailed block diagram showing the mapping to frame sequence values feature,

Figure 5 illustrates diagrammatically part of a video frame showing how it is made up of pixels,

Figure 6 is a diagram representing the lines produced by an analogue television signal,

Figure 7 is a formula for generating a value block of 20 x 20 pixels,

Figure 8 is an illustration of block arrays for two video frames,

Figure 9 is an illustration of one block array,

Figure 10 is an illustration of the processes used when recording new video material or analysing a pre-recorded tape,

Figure 11 is an illustration of the processes used for identifying a tape and its contents,

Figure 12 is an illustration of the steps involved in analysing a tape and creating a data base in memory,

Figure 13 illustrates the steps involved in identifying a tape,

Figure 14 illustrates one embodiment of screen display,

Figures 15a and 15b illustrate two screen display options, and

Figure 16 illustrates in simplified form another apparatus for implementing the described invention.

The various aspects of the invention will be described hereinafter, by way of example only, in relation to an application where the video storage media is a video cassette tape. Their application to other video storage media will be apparent to one skilled in the art.

A tape control system according to one aspect of the present invention comprises a means operable to control a tape storage device via an infra-red control signal and a means for determining tape position based on the data received from a tape reading means. The tape reading means reads time code or other data encoded on to the tape so as to enable individual selection and retrieval of multiple sets of recorded data and signals.

For one particular application which we have in mind the tape storage medium

comprises a video tape and the signals to be recorded may comprise audio visual signals or data signals or a combination of both. In our co-pending application we describe how data signals transmitted by a terrestrial, cable and satellite T.V. networks can be converted into a form suitable for storage on to magnetic storage tape. Such data may be stored alongside analog or digital picture components. We also describe how a video cassette can be used to provide a high capacity data storage system for storing entire digital frames of data on the same tape as the analog video component to facilitate storage and retrieval of associated data down loaded from the Internet or other sources of such information. In such an application it becomes advantageous to be able to retrieve the information quickly and to be able to identify the information recorded on the tape. It is also advantageous to be able to automatically access that information and when it is no longer required to be able to designate previously recorded areas as available for over recording and/or deletion of previously recorded matter.

In order to be able to accurately determine tape position one embodiment of the present invention provides means for applying a marker at intervals along the tape. Ideally the marker provide a time code, frame number and total frame elapsed since the start of the tape and optionally a session name. These markers are recorded on the tape during recording thereof and reading of the markers enables a specific location to be arrived at by appropriate forward and reverse movement on the tape under programme control.

Different video cassette recorders (VCR) will have different operating parameters especially in relation to fast forward and rewind modes. For example

some video recorders reach fast forward or fast reverse speeds more quickly than others. The markers on the tape can be used to determine the operational characteristics of the video recorder in which the tape is located. Thus by operating the cassette recorder in rewind and fast forward modes the time of operation in either of those modes can be correlated with tape distance so that when the controller switches back to playback mode the next occurrence of a marker will enable the program to decide whether the tape is in the intended retrieval position or whether it needs to go forwards or backwards towards the intended position of the data to be retrieved. In a preferred embodiment characterisation data for the VCR is used to ensure that the desired tape position is located as quickly as possible. This characterisation data may be derived from a manufacturers code or assimilated using an assimilation routine such as previously outlined.

Referring more specifically to Figure 1, a video cassette recorder (VCR) and a television (TV) are illustrated and a block diagram of processing circuitry which may be a self contained unit or incorporated into the VCR or another signal processing device where it is desired to avoid unnecessary component duplication. The processing circuitry includes a CPU 1, an encoder 2, a decoder 3, a memory 4 and an infra-red control unit IR. The also illustrated is a tuner T for processing television signals. I/R unit send VCR I/R codes and receives handset commands. Line 9 transmits the signal to be displayed on the television. Video system 5 displays options on the TV screen as mentioned further hereinafter. The CPU generates signals for text or graphics for the TV screen which are sent to the video system over line 11. Line 7a represents an output line for data decoded from a tape.

When the VCR is operating in record mode signals to be recorded, for example TV signals decoded by the tuner T or other signals input by way of the data port input line 7a, are passed to the encoder 3. Under the control of the CPU data index signals are generated and combined with the other signals at prescribed intervals, for example every second or part thereof. Where the signal to be recorded includes picture component, then the data signals are conveniently timed to reside in the vertical blanking interval between selected frames. The information recorded as part of the data index may comprise any preferred combination of time code, frame number, total frames elapsed and/or session name.

The information available from the data index enables any desired position to be located on the tape as will be described further hereinafter.

Selection of the desired position is made easier if the user knows what is recorded on the tape at any particular position. Accordingly, the invention also proposes storing in a file index or file allocation table (hereinafter referred to as a FAT) information on the tape corresponding to the contents of the tape.

The contents of the tape may comprise one or more sets of signals or data. The FAT is created using associated programming software incorporating a character generation set to facilitate titling of the recorded material. The title will usually be augmented by data relating to the length of the contents and its physical position on the video tape which will be completed automatically. The FAT is recorded on the tape at the end of each recording session. More particularly where a new FAT is written to the storage tape when a new signal or data is appended to the tape, each new FAT contains additional information related to the appended signals or data plus

data corresponding to the previously recorded FAT. Thus each successive FAT is a cumulative index. Prior to commencing a new recording session the last FAT is written into memory 4 preferably automatically under the control exercised by the CPU so that when the new FAT is created this information can be incorporated into the new FAT. It is proposed that when the VCR is being programmed for recording, the user is presented with recording options conveniently by way of a display on screen or an I/R hand set. The CPU controls the generation of an option menu using the video system to permit the user to enter contents information for the material to be recorded. The software in the CPU can automatically issue control commands to the I/R unit to control the VCR. Using the I/R unit, I/R signals are transmitted to the VCR to instigate rewind, fast forward, playback and record functions so that current tape position and current tape contents can be identified and the necessary information written into memory. During playback the data index is read from the tape by the VCR passed to the decoder so that a track of the current tape position is known. When a user wishes to locate a specific item on a previously recorded tape, the operations involved will be as follows . For ease of use, the present invention proposes that the tape is automatically stopped at the beginning of the last recorded FAT. Thus on inserting a tape, the CPU will perform a playback operation to read into memory the controls of the tape from the FAT and the current tape position from the data index. Information identifying the contents are conveniently displayed on screen. The CPU preferably provides a menu for selecting options such as playback or delete. Once a desired playback option has been selected the CPU directs the VCR to the current position on the tape as the time for fast rewind or fast forward will be

calculated in relation to the current and desired tape position having regard to the characterisation data of the VCR.

A similar process can be followed for record. The user menu can provide record options for example connection time for recording, material to be recorded e.g. record T.V. material, T.V. material with data, internet data etc. and will allow the user to input characters identifying the contents which will become part of the FAT for subsequent identification purposes. Thus it will be apparent from the above that the position of the tape can be initiated using the I/R controller and facilitates automatic positioning of the tape to a selected position.

From the contents of the FAT it is possible to determine whether sufficient unused tape is available for new storage of new signals or data. The programme software can be used as means of selecting which existing signals or data can be over written in order to provide sufficient storage for new signals or data.

Referring specifically to Figure 2, the leading end of a length of video tape is illustrated in a manner to show how conventional analogue video may be recorded on successive frames - see for example frames such as those referenced a/v - between these frames are the vertical blanking intervals (reference VBI) which can store data at the rate of the order of 640 Mbits/hr. In accordance with one aspect of the invention, some of the VBI are used as the location for the 'periodic' data indexes see DT1 and DT2. Two are shown in the example six frames apart. This spacing is only for illustration purposes and not to be taken as necessarily representative of the actual spacing. The data indexes include time code, frame number, total frames and session name in a preferred implementation of the invention. The session name may be the

equivalent of a track reference assigned automatically by the recording software to each particular recording session, or user input information identifying the recorded material by its contents.

An index is provided for each recording session and is recorded at the end of each session. These are the files indexes or a file allocation tables for which the reference FAT is used in the illustration. Two tables are shown - representing the contents of two recording sessions. It will be noted that these blocks of data occupy the a/v frame and the VBI and typically they are capable of accepting data at the rate of 4 to 20 Gbits/hour for a typical domestic video cassette. The successive file allocation tables are cumulative, i.e. each successive table contains the contents of all the previous tables and contain certain data segment indexes, physical position and video position data relating to each recording session.

In operation it is preferred that the tape control system will operate to locate the last FAT so that the contents of the tape may be displayed to the user for the purpose of selecting playback and recording options. A preferred mode of operation leaves the tape at the end of the last recording session. The index is displayed on screen and for playback the user selects the desired session. The tape controller uses the characterisation data for the tape storage mechanism (VCR) in conjunction the current tape position data to determine the time for which the tape rewind has to operate to end up at the desired position; whereupon the control device switches to playback so that the data index can be read to confirm that the correct position has been reached and if not the machine makes further adjustments and playback checks until the desired position has been reached. At this point, the recorder either

commences playback if auto playback has been selected or awaits input of the playback instruction.

A corresponding process can be used where a recording is to be made at a position on the tape other than at the end of the last recording. In the recording mode, data indexes are automatically added to the tape at the prescribed periodic intervals and at the end of the recording session the file allocation table is compiled and recorded on the tape. Titling may be recorded at this stage by the user, but more usually is input when programming in details of the recording session. Position information and programme duration in terms of time and total frame numbers is derived by calculation from information read into memory and then recorded in the file allocation table. The contents of any previous file allocation table for that tape are input from the storage memory to give the cumulative file allocation table.

Reference is now made to embodiments of the invention which determine storage media position having regard to the contents thereof.

Referring firstly to Figure 3, illustrated pictorially is a video cassette recorder VCR, and a television TV and in block form within the dotted outline STB various of functional units. These functioned units conveniently form part of a set top box, but could be incorporated within either the video cassette recorder or the television or any other associated hardware. The functional units comprise an analogue digital converter ADC, a central processing unit CPU, a memory M, a video system VS and an infra-red control unit IR. This configuration corresponds substantially to that disclosed above in relation to controlling tape position, storing details of tape contents and utilising on-screen displays to review tape contents and to select an appropriate

positions for replay or recording of a tape.

Figure 4 shows all the apparatus features of Figure 3 plus the further functional units required to determine the frame values and to subsequently determine tape position. The further functional units comprise a mapping circuit MC, a filter circuit F, a data base DB, and a controller C. The operation will be described further hereinafter.

In Figure 5 there is illustrated part of a video frame comprising a 625 x 800 pixel array designated X_1, X_2, X_3, ... X_{800} and Y_1, Y_2, Y_3 ....Y_{625}. Any particular pixel can be defined using *xy* coordinates. In a preferred method of generating a frame value we select blocks of 20 x 20 pixels, each block is assigned a value according to the formula illustrated in Figure 7 representing a single video frame. These values are then compared with the corresponding values generated for the previous video frame as illustrated in Figure 8. The value that has changed the most compared to the previous frame and the X, Y co-ordinates thereof are stored in Dbase memory of Figure 10 along with pictures and information representing the tape, its position and other information such as picture, text or data. Subsequent frames or groups of frames are similarly analysed as shown in the flow chart of Figure 12 until a data sequence has been formed that represents the entire video tape. This sequence can be generated during record or for pre-recorded tapes by playing the tape and analysing its contents.

Figure 11 and the flow chart of Figure 13 illustrate the process of identifying a tape, its contents, status and position. Signals from the VCR can be compensated for horizontal or vertical offsets by the XY offset prior to entering the calculation of

summed pixel blocks according to Figure 7 and array blocks of Figure 11. Difference values are again calculated, but here all or most values are retained and stored in Store of Figure 11 for comparison with previously calculated single frame values in Dbase memory. The comparison process consists of extracting from Dbase memory of Figure 11 the X, Y co-ordinates of the best value stored according to the processes of Figure 10. These co-ordinates are used to index the current difference value from Store of Figure 11, its value is extracted and compared to the corresponding value held in Dbase memory of Figure 11. This process is repeated for a sequence of values until the best match is found. A best matching sequence is used to extract further information from the Dbase memory to indicate the tape, its contents, position and pictures text or data.

Referring now to Figure 14, when it is desired to utilise the likes of an automatic tape positioning mechanism to transport the tape to a desired location it is first necessary to identify the tape which is loaded into the video cassette recorder and its contents and the current position of the tape so that the desired position can be achieved with the minimum of user interference. Thus the first step is to generate a sequence of frame values from the tape. This is performed automatically by the system and follows steps 1 to 4 of Figure 13 and is represented by store of Figure 11. Once a frame sequence has been obtained this has to be compared with the frame sequences stored in memory in order to find a match. Thus at step 7 the controller selects a first frame value sequence from those stored in memory. One such frame value sequence is represented diagrammatically at 6'. At this stage the computer is merely concerned with the frame value sequence. In practice other information will

be appended to that record, for example program identification data. In any event its location in memory may be used to indicate the relative position of the identified section of tape. The frame value sequence retrieved from memory is compared at Step 8 with that obtained from the tape. If there is a match then the tape has been identified and an appropriate display initiated. Usually this will be details of the contents on that tape. If no correlation has been found the search continues. Step 9 represents incrementing of a memory pointer so that when Step 7 comes around next time, the next frame value sequence is recovered from memory. Step 10 checks to see whether the last frame value sequence has been reached and aborts the search if yes and causes an appropriate message to be displayed. If not, then the search continues on an incremental basis working through all the frame values sequences stored in memory (see loop 11) until either a match is found at Step 8 or the stored memory sequences have been searched and no match found in which case the sequence is aborted and an appropriate message is generated for example error or tape not identified.

One skilled in the art will appreciate how tape position derived by the above described technique can be used in conjunction with a tape control system as described herein.

There is now described the creation of a table of contents for a tape. This may be used to advantage in conjunction with the afore-described technique for generating tape position information or identifying thereof. Figure 16 illustrates apparatus which has all the features of the apparatus of Figures 3 and 4 and hence it is not described in any detail in those respects. Corresponding reference numerals

have been used to denote corresponding parts. Thus the afore-described controller database, adc, mapping filter circuitry can be regarded as part of the CPU and a encoder 2. Also illustrated is, a decoder 3, a tuner T, an output line 7a and input lines 7b and 7c.

The tuner is provided for decoding television signals for viewing on the T.V. or recording on the VCR. Line 7b provides an optional input for an external video signal and line 7a provides an optional input for external data such as a phone line which may be connected to an internet site. Line 7a is an optional decoded data output.

In analysing the frames of the video to determine the frame value sequences, the actual contents of whole frames both video and audio is also preferably written to memory at periodic intervals. In fact this could be done independently of calculating frame value sequences where it is merely desired to create a useful tape index independent of tape position information. For example where automatic tape control is not required. Alternatively other methods of tape position could be used. More particularly, for example every 5 minutes of tape play time, a sequence of frames are recorded in memory. More preferably these will have appended to them the relevant frame value sequences or other tape position data. The number of frames stored in memory may be sufficient to play a few seconds of the recorded material or just a single video frame.

This results in the creation of a table of contents for the tape which is represented by what can be conveniently termed a plurality of snap-shots of the tape contents taken at discrete intervals throughout the tape. Preferably the lead image

will have a sequence of further images associated with it corresponding to the next few seconds of frames. The lead images are stored in memory so that they can be displayed on screen simultaneously or at least a plurality thereof, for example in a format as illustrated in Figure 14. Displayed on the screen 100 are twelve pictures. In this example pictures 4 - 11 are blank. Some of the sequence of frames associated with picture 1 are shown at b and c. An associated audio signal is shown at d. Shown displayed at the right hand side of the screen 100 at 102 - 106 and along the bottom at 107 are some control menu options. These are described further hereinafter.

It will be understood that the memory M contains characterisation data for the VCR as well as details of the tape contents and the control program. The CPU runs the software. Selection of the options displayed on screen is by movement of cursor 101 controlled by a remote key pad or by a mouse. Clicking on 105 or 106 enables the viewer to see more screens of tape images. These may be for the same tape where there are more images than can be accommodated on one screen or they may be for the contents of other tapes which are stored in memory. Moving the cursor over one of the images displayed will play the associated sound and/or frame sequence. Clicking on a picture instigates an auto play command which utilises the available tape position data and the VCR transport controls to locate the chosen frame on the tape and commence replaying of the tape. When tape position data is not recorded on the tape the above discussed technique of calculating frame value sequence is used to determine the current position and thereafter to locate the desired position as otherwise discussed in our earlier patent application.

On switching to VCR play or replaying of the sequence from memory, an alternative screen display is adopted as shown in Figure 15a. The user has the option to go to a full screen display as shown in Figure 15b by clicking on 108 and thereafter to revert to the display of Figure 15a by clicking on 111. Clicking on 109 stops the play mode. Clicking on 110 reverts to the index display with so called thumbnail pictures.

Other options on the index display include selection of TV guide or VCR screen - see 104 and 103 respectively. Other options with regard to record functions can be achieved through the menu options which are not described further herein.

The audio track or Closed Caption data could alternatively be used to generate data sequences that identify a tape and its contents. Closed Caption data is already in a digital form and could be correlated with tape position data in the memory Dbase. For audio signals the phase of the audio component is usually corrupted by the VCR recording and play back circuits. Auto-correlation is a well known technique that can be employed to place the audio components into a predetermined phase relationships for pattern matching. Closed Caption data could also be deployed for automatic titling. It should be obvious to one skilled in the art how other techniques such as hamming codes could be applied to generate data sequences representing audio, picture or data content of the video tapes. It is not intended to limit the scope of this patent to storing difference values based on summing pixels, or to video cassettes.

Where automatic control provisions exist the programming circuitry includes means to determine the status of the media device to verify that it is switched on when so required and to check that the video media is in the appropriate position and

that the selected material to be recorded is being recorded. When record functions have been selected to be initiated automatically at some future time, means is provided to disable the operation of the device, in the meantime.

Where items are recorded on video tape, means is provided to indicate visually to the viewer whether they have been viewed, thereby indicating for example whether they are available for recording over.

As regards the contents of the video tape which are stored in memory, it is advantageous if the index includes a facility for categorisation of the program material. Conveniently means is provided for displaying the contents for a selected category.

The facility to store images representing the content of a video medium - e.g. any one tape, in the form of a visual representations as described hereinabove can be extended to program providers so that electronic program guides may include such visual representation of program currently being shown or to be shown at a future date. The images for any one or for all or a plurality of programmes currently being shown or to be shown could be displayed on screen and from which a user would make a program viewing or recording selection. Again the program material may advantageously categorised and means provided to display only a selected category or categories.

Subtitles or closed caption data may be stored as part of the program contents of recorded media and means provided to search same to identify and display media contents in a selected category.

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CLAIMS

1. A video storage media control system comprising means operable to control a video media storage device, means for determining video media position, means for identifying the contents of the video media and the position thereof on the media, means for determining the amount of media available for recording, be it unrecorded media or portions thereof selected as available for recording over, and means providing display of control menus from which video media storage device control options can be selected including selection of material to be recorded and characterised in that the means for determining video media position and the means for identifying the contents of the video media are based on signals present on the conventional video output terminal.

2. A video storage media control system as claimed in claim 1 in which the video media position is determined by reading position data recorded on the video storage media.

3. A video storage media control system as claimed in claim 1 in which the video media position is determined by establishing a match or relationship between a data sequence or data value generated from contents of the media with data sequences or a data value stored in the memory for one or more video media to which data sequences or a data value incorporate position related information.

4. A video storage media control system as claimed in claims 1, 2, or 3 further comprising means for automatically controlling the video media storage device transport functions to locate a desired position on the video media storage device.

5. A control system as claimed in anyone of claims 1 to 4 in which the video media storage device is a tape storage device.

6. A control system according to claim 5 in which the means for determining video media (tape) position is based on signals or data received from a tape reading means.

7. A control system as claimed in anyone of the preceding claims in which control is instigated using an infrared control signal.

8. A control system as claimed in anyone of claims 5, 6 or 7 further comprising means for encoding the data to be recorded onto the tape at prescribed intervals.

9. A control system as claimed in claim 8 in which the data comprises one or more of time code, frame number, total frames and session name.

10. A control system as claimed in anyone of claims 5 to 9 in which the data is recorded in selected Vertical Blanking Intervals.

11. A control system as claimed in anyone of the preceding claims in which the tape is automatically repositioned to a selected desired position utilising characterisation data determined for the tape storage device.

12. A control system as claimed in anyone of claims 5 to 11 and further comprising recording onto the tape an index of material recorded on the tape which provides readable information identifying the nature of the recorded material and its position the tape.

13. A control system as claimed in claim 12 in which multiple file indexes are recorded on the tape, one after each recording session.

14. A control system as claimed in claim 13 in which the successive file indexes are cumulative.

15. A control system as claimed in anyone of claims 5 to 14 comprising memory means external to the tape for holding the content of at least one file index.

16. A video control system as claimed in claim 3 in which the signals received from the reading means are the video output signals of the video recorder which represent contents of the video media, be it the visible content, audio content or close caption data or other signals recorded on the video media, and any of said contents are used to generate a data sequence or data value from which tape position is determined by comparing said data sequence or data value with data sequences or a data value stored in memory.

17. A video control system as claimed in claim 16 in which the data sequences or data value for a plurality of video media are stored in memory.

18. A video control system as claimed in claims 16 or 17 in which at least some of the data sequences or the data value stored in memory have appended thereto data which facilitates reproduction of the image of at least one frame of the sequence.

19. A video control system as claimed in claims 17 or 18 in which the memory contains stored images of a plurality of frames taken at intervals along the video media.

20. A video stage media control system as claimed in anyone of claims 1 to 19, comprising means for sending commands to the apparatus to instigate positioning of the video media at a desired position, and wherein the desired position is arrived at automatically by reading the video media to obtain position information by establishing a match or relationship between a data sequence or data value generated from contents of the media with data sequences or a data value stored in the memory for one or more video media, which data sequences or a data value

incorporate position related information and changing the position of the video media until the desired position has been obtained.

21. A video media control system as claimed in anyone of claims 1 to 19 comprising means for sending commands to the apparatus to instigate positioning of the video media at a desired position, which position is selected from an on screen display, which display comprises one or more screen images of the contents of the video media and wherein the desired position is arrived at automatically by reading the video media to obtain position information, direction or indirectly, and changing the position of the video media until the desired position has been obtained.

22. A video media control system as claimed in claim 21 in which the contents are stored in electronic memory or on video storage media, be it magnetic or optical, the index comprising a plurality of images corresponding to each of the contents of the video storage medium at different positions thereof and wherein the index is adapted to be read and displayed on a television screen, enabling the selection of one or more of a plurality of scenes of the recorded content.

23. A video storage media control system as claimed in anyone of the preceding claims in which selection of the material to be recorded is selected from an electronic programming guide.

24. A video storage media control system as claimed in anyone of the preceding claims in which the contents of the video media are stored in memory in the form of one or more images taken at intervals and images which are available for display on screen.

25. A video storage media control system as claimed in claims 21, 22 or 24 in which each image has an associated sequence of images stored in memory which can be reviewed by a user command.

26. A video storage media control system as claimed in anyone of claims 21 to 25 in which the images comprise a sample of the contents of the video media at periodic intervals of the video medium.

27. A video storage media control system as claimed in anyone of claims 21 to 26 in which the contents of the memory tape include audio signals.

28. A video storage media control system as claimed in anyone of the preceding claims in which selection provisions allow a user to playback the video starting from the position of any one of the display images.

29. A video storage media control system as claimed in anyone of the preceding claims in which selection provisions allow the user to mark the displayed images for recording over.

30. A video storage media control system as claimed in anyone of the preceding claims for programming a video storage media device from selections made in a electronic programming guide comprising the steps of: - (1) issuing the necessary commands to the video storage media device to enable it to play the associated media, (2) reading the video media to determine the contents and/or position thereof, (3) using content and/or position related information to determine if sufficient room is available for recording the selections, (4) using the necessary commands to cause said video storage media device to record material based on said selections at a designated position of the media based on calculations of the free space or space marked for overwriting and wherein the contents and/or

position of the video media are determined from signals present on the conventional video output terminal.

31. A video storage media control system as claimed in claim 30 in which the contents and/or position related information is determined by reading data recorded on the tape.

32. A video storage media control system as claimed in claim 30 in which the contents and/or position related information is determined by comparing or verifying a relationship between a sequence of data signals or a data value generated by reading the contents of the tape with a pre-stored sequence of data signals or data value.

33. A video storage media control system constructed and arranged and adapted to operate substantially as hereinbefore described with reference to anyone of the accompanying drawings.

34. A video tape control system substantially as hereinbefore described with reference to the accompanying drawings.

35. A storage video tape recorded with data and/or file indexes substantially as hereinbefore described and illustrated in the accompanying drawings.

36. A closed loop video recorder or other media device control system for determining the status of a video recorder or other media device, consisting of the steps of, (1) issuing a play command or code or sequence, (2) verifying that signals or data are received, (3) using said signals or data or absence of signals or data to determine if said video recorder or other media device is powered on.

AMENDED SHEET

37. A close loop control system as claimed in claim 36 further comprising the steps of, (1) checking that the tape or media position is substantially unchanged from a predetermined position, (2) issuing a record command or code or sequence.

38. A closed loop control system as claimed in 36 or 37 further comprising the step of verifying the signals or data received from said video recorder or other media device correspond to a selected program designated for recording.

39. A system for controlling a video recorder or other media device for selective enabling and disabling of associated functions, comprising the steps of, (1) periodically assessing the presence or content of signals and/or data output from said video recorder or other media device to determine if device is operating, (2) determining if said video recorder or other media device is scheduled and/or permitted to operate at time of assessing signals and/or data, (3) if required issuing a command or code or sequence to disable said video recorder or other media device by a power off command and/or a stop command and/or a pause or other command.

40. A system as claimed in anyone of claims 1 to 19 comprising a graphical user interface adapted to display information relating to television program content and/or data content from other sources such as the Internet and video recorder or other media device content, wherein selections are made from said television program content and/or data content from other sources for recording onto video tape or other media whereby calculation of available free space on said video tape or other media is displayed and whereby if insufficient space is available for recording original selections may be modified and/or some or all or the video tape or other media contents may be selected for overwriting.

41. A system as claimed in 40 in which the graphical user interface is adapted to display the status of items recorded on video tape or other media as to whether the recorded item has been viewed.

42. A system as claimed in claims 40 or 41 in which the graphical user interface is adapted to display information relating to one or more video tapes or other media contents, wherein the contents of said video tape or other media is displayed either graphically or texturally according to the category of the recorded material, said category could be the type of recorded material or whether the item is suitable for a particular age of viewer or whether the items have been viewed or any other criteria.

43. A graphical user interface adapted to display information relating to television program content and/or data content from other sources such as the Internet and/or video recorder or other media device content, wherein said display information comprises a visual representation such as a picture indicating the contents of said television program content and/or data content from other sources such as the Internet and/or video recorder or other media device content.

44. A graphical user interface as claimed in claim 43 in which said visual representations are stored in memory, at least temporarily, to permit on screen display.

45. A graphical user interface as claimed in claim 43 or 44 wherein the graphical user interface is adapted to display television program content information by category such as what is currently showing and/or what will be showing next and/or what is showing that day and/or what will be showing that week.

46. A graphical user interface adapted to display information as claimed in claims 43, 44 or 45 further adapted to filter said television program content by category of user preference such as channel number or type of television program or other category.

47. A video recorder or other media device index generation method comprising the steps of, (1) recording a television broadcast, (2) recording in a memory means a copy of subtitling or closed caption data, (3) using said subtitling or closed caption data to search for key words or phrases to identify a scene from one or more video tapes or other media corresponding to said key word, (4) issuing a command or code or sequence to position said video tape or other media at the scene corresponding to said key word.

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ABSTRACT

A video media storage control system to control a video media storage device, be it for a tape or other storage media, includes means for sending commands to the device to instigate positioning of the video media at a desired position and where the desired position is arrived at automatically by reading the video media to obtain position information, directly or indirectly, and changing the position of the video media until the desired position has been obtained. Positioning may be for record or playback purposes. According to one aspect of the invention selection of the desired position at least for playback is controlled selectively from a display of the index of contents of the video media, which display includes at least one image of the contents and preferably a plurality of images on the media taken at discrete intervals. Positioning of the video media may utilise characterisation data for the video media storage device. More particularly the position information is obtained by reading position data recorded on the tape or alternatively by generating position data from the contents of the video tape for example by reading the tape and generating a data sequence or data value derived from the contents of the tape and storing same in memory in conjunction with position information.

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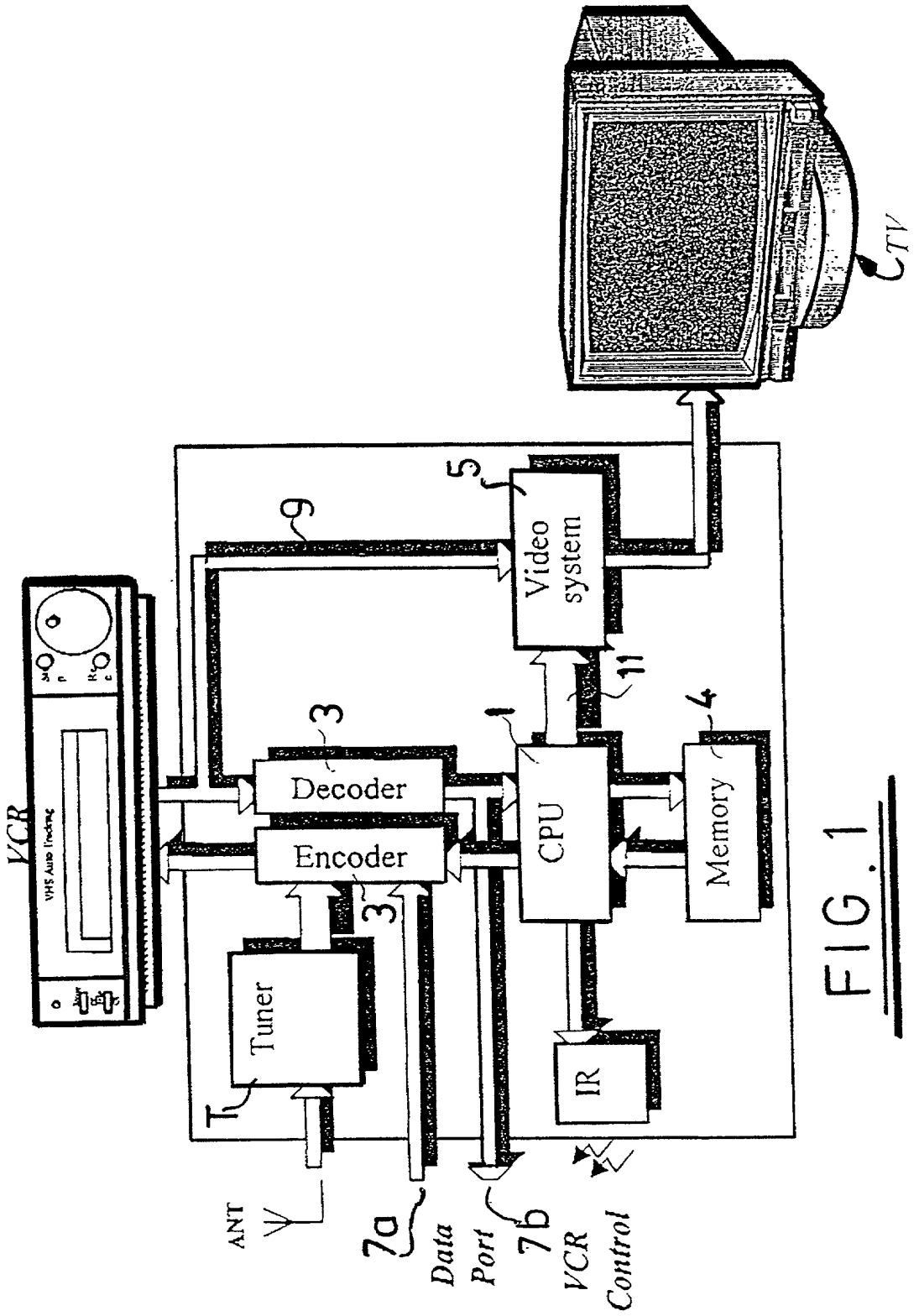
TV
5
Video system
9
11
4
Memory
3
Decoder
1
CPU
Encoder
3
VCR
VHS Auto Tracking
Tuner
IR
ANT
7a
Data Port
7b
VCR Control

FIG. 1

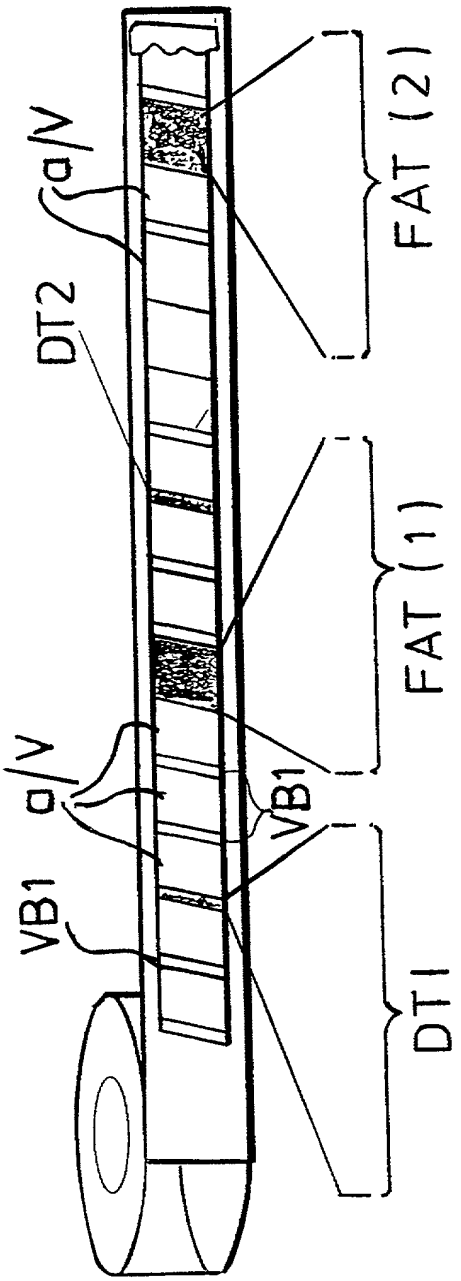

FIG. 2

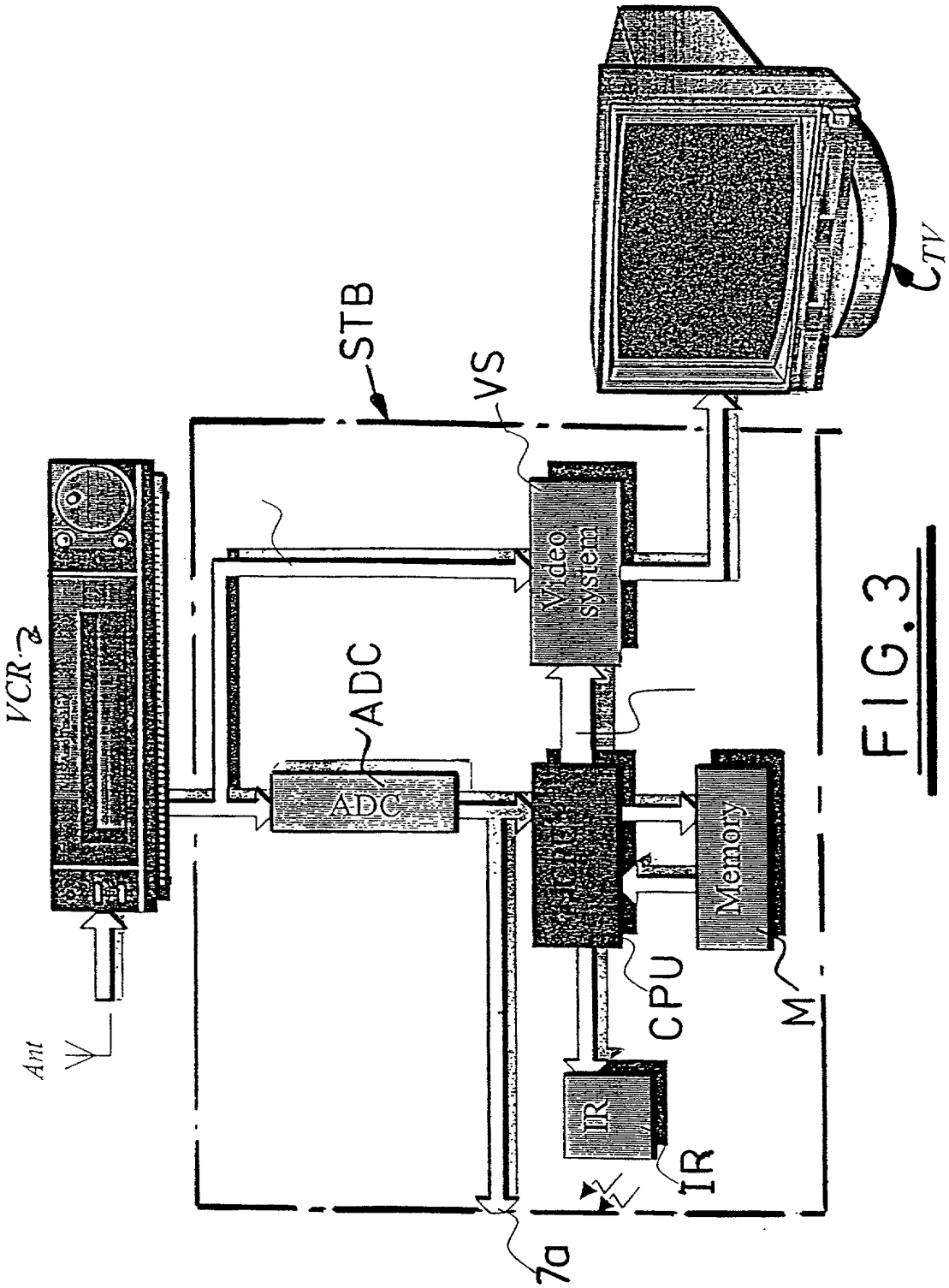

FIG.3

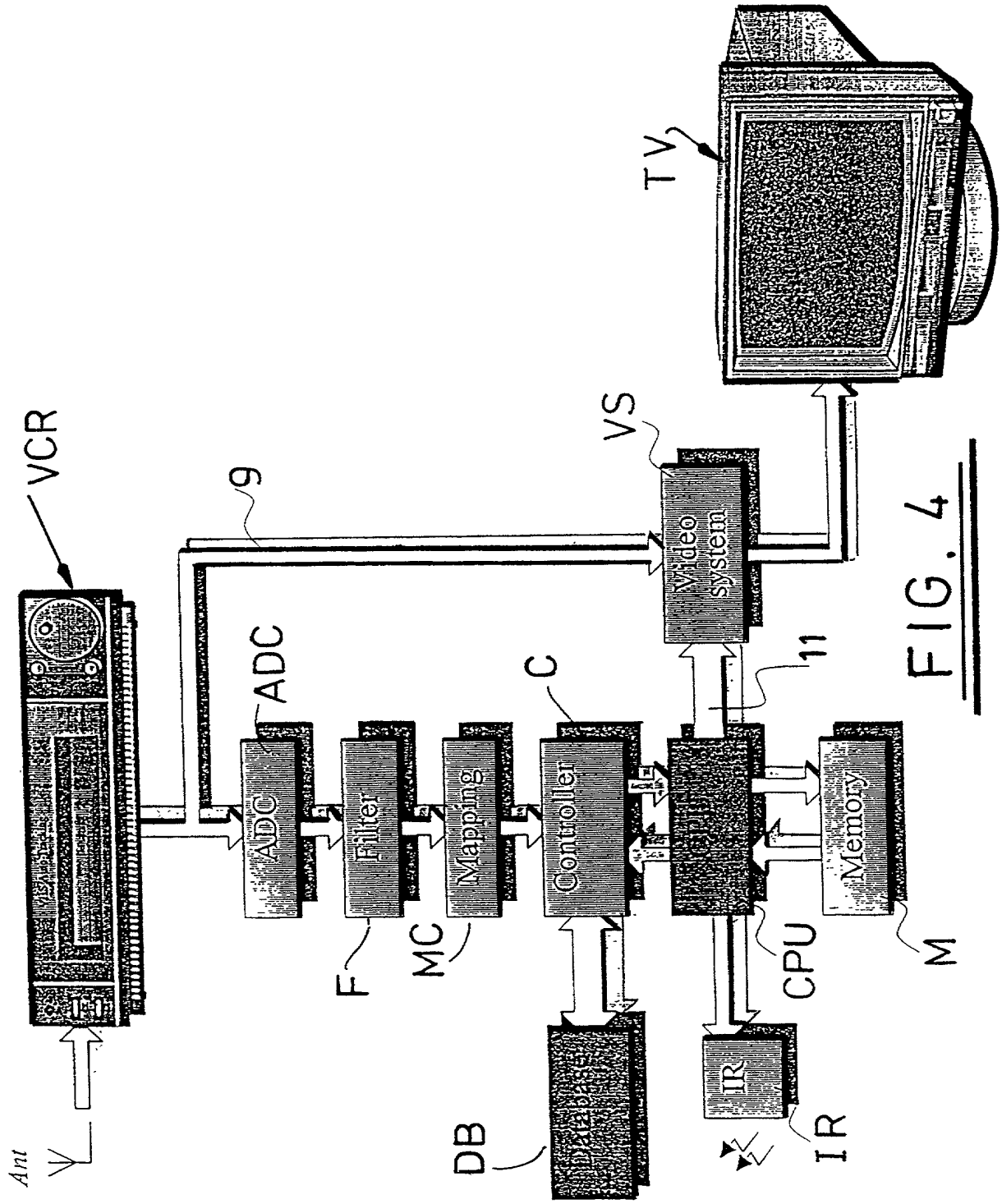
TV
VS
Video system
VCR
9
ADC
ADC
Filter
Mapping
C
Controller
11
Memory
F
MC
CPU
M
DB
Database
IR
IR
Ant

FIG. 4

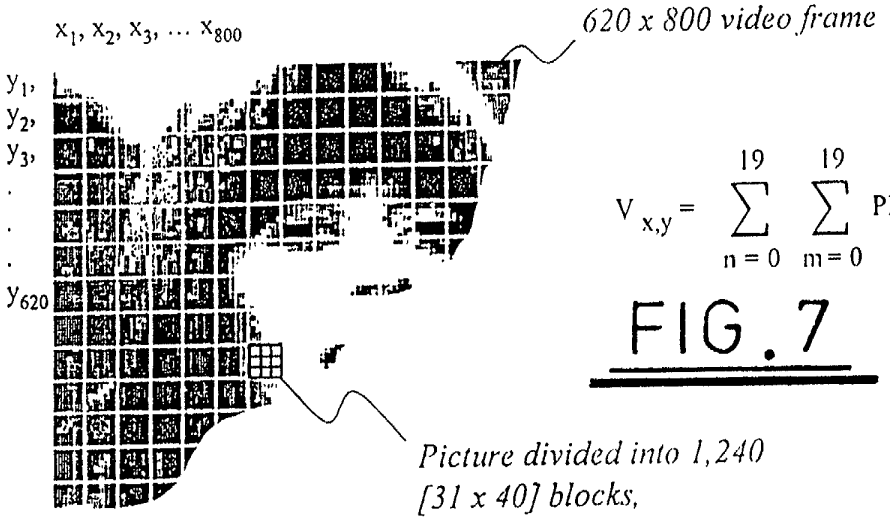

FIG. 5

$$V_{x,y} = \sum_{n=0}^{19} \sum_{m=0}^{19} PIXEL_{x,y}$$

FIG. 7

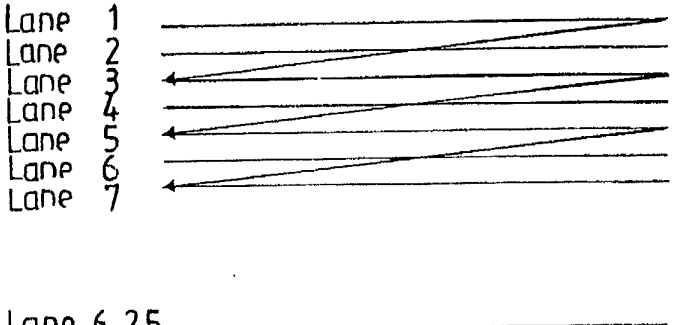

FIG. 6

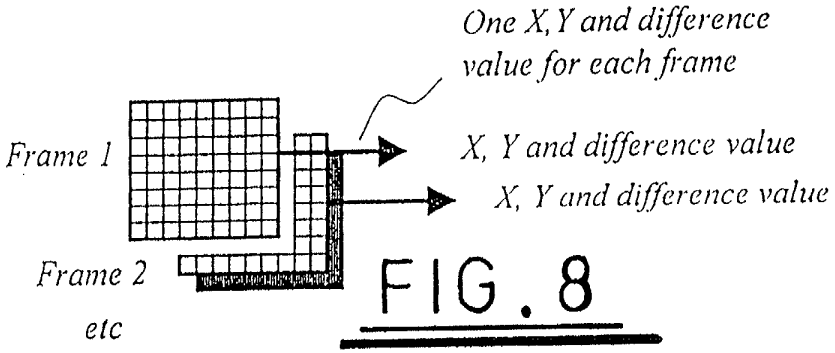

FIG. 8

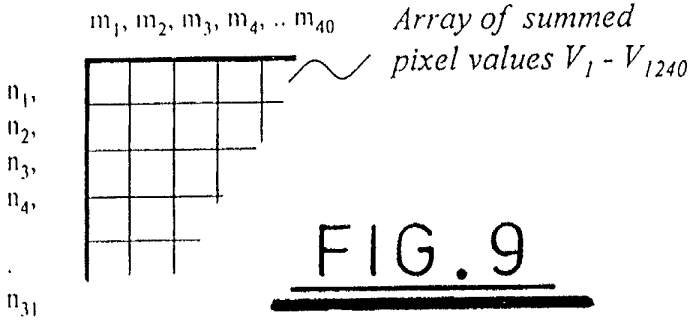

FIG. 9

SUBSTITUTE SHEET (RULE 26)

PCT/GB98/02166

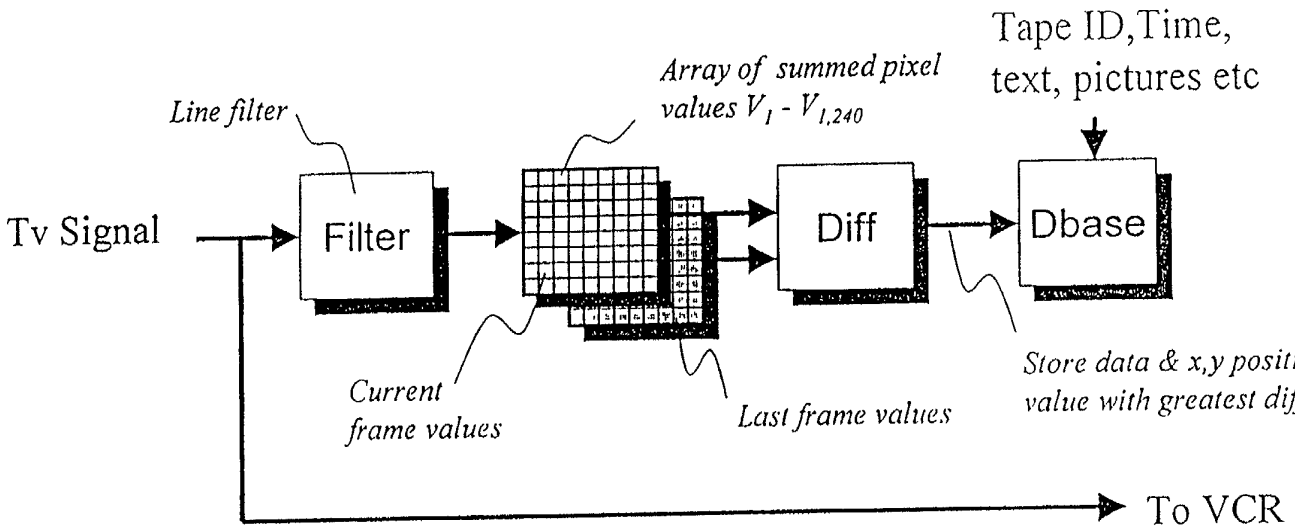

Fig 10 FIG. 10

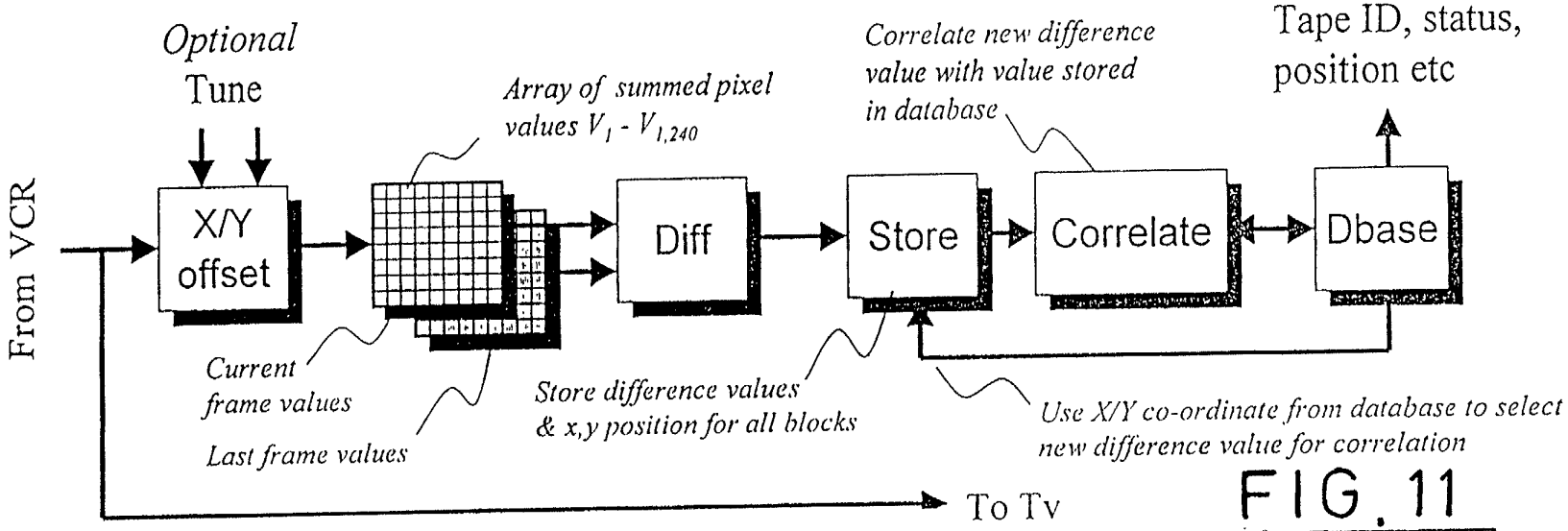

FIG. 11

SUBSTITUTE SHEET (RULE 26)

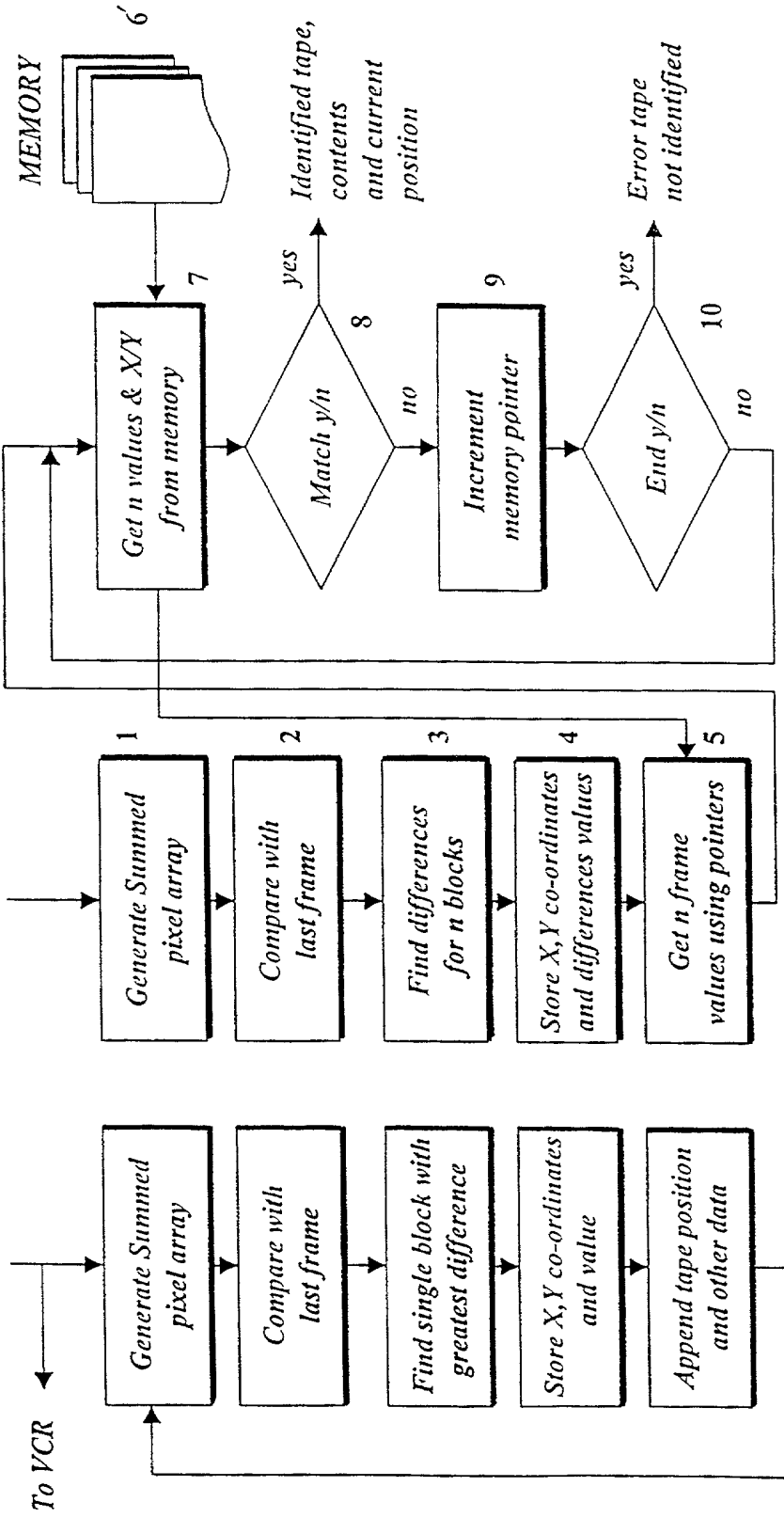
TV Pictures
To VCR
Generate Summed pixel array
Compare with last frame
Find single block with greatest difference
Store X,Y co-ordinates and value
Append tape position and other data
Write to memory during record for new recording, or during play for old recordings,
MEMORY
From VCR
1
Generate Summed pixel array
2
Compare with last frame
3
Find differences for n blocks
4
Store X,Y co-ordinates and differences values
5
Get n frame values using pointers
'n' frame values generated to determine current position
MEMORY
6'
7
Get n values & X/Y from memory
8
Match y/n
yes
Identified tape, contents and current position
no
9
Increment memory pointer
10
End y/n
yes
Error tape not identified
no

FIG.12

FIG.13

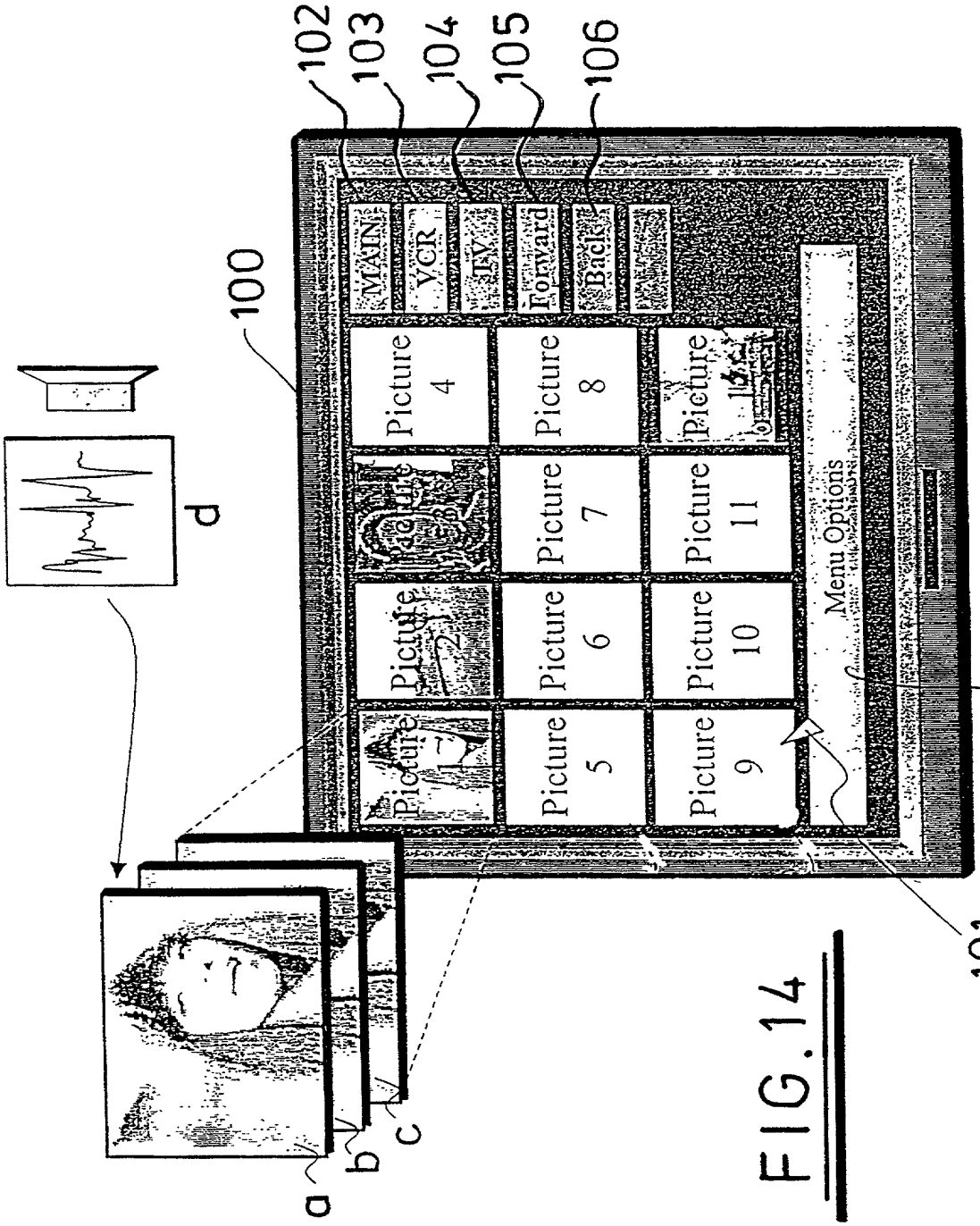
100
102
103
104
105
106
MAIN
VCR
TV
Forward
Back
Picture 1
Picture 2
Picture 3
Picture 4
Picture 5
Picture 6
Picture 7
Picture 8
Picture 9
Picture 10
Picture 11
Picture 12
Menu Options
106
101
a
b
c
d

FIG. 14

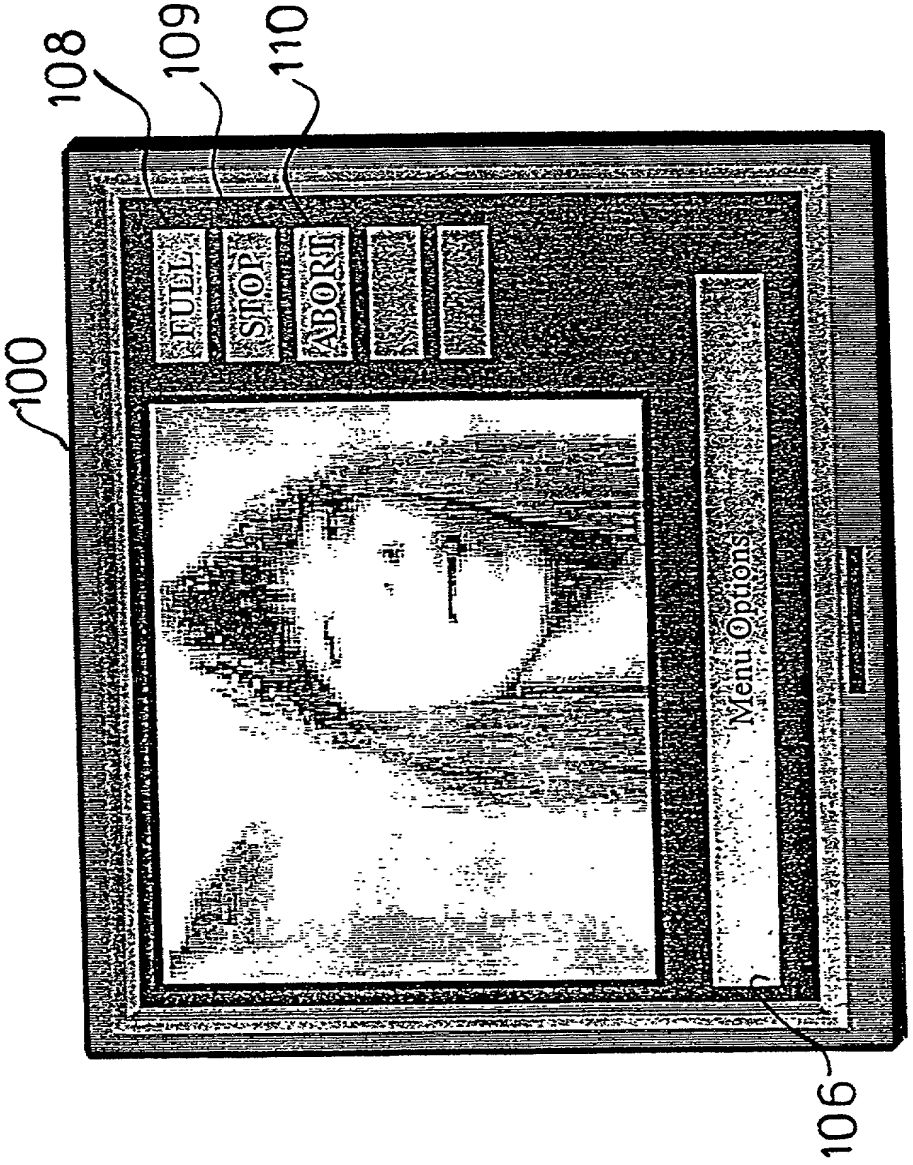

FIG.15a

FIG. 15b

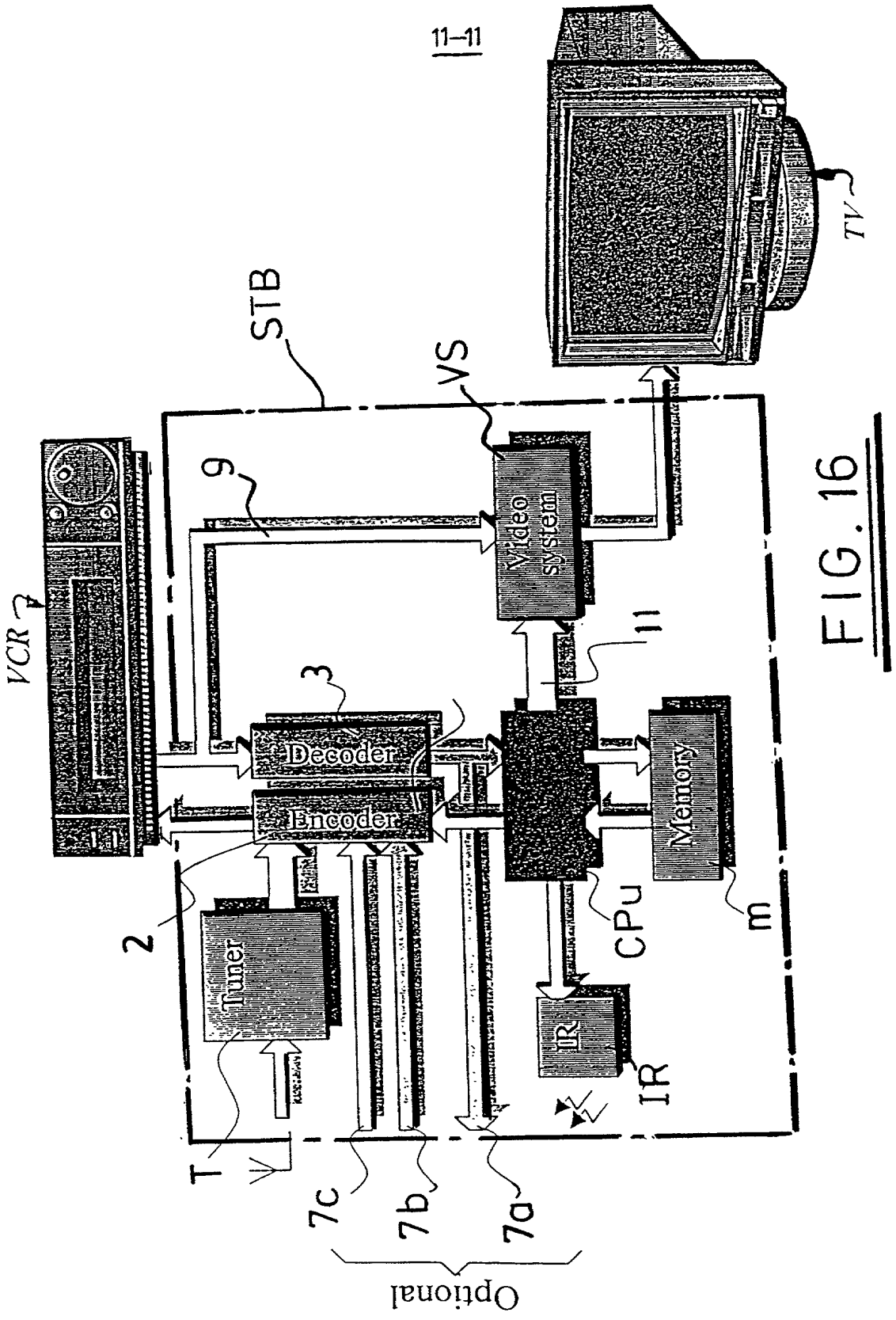
11–11
TV
STB
VS
9
Video system
VCR
11
3
Decoder
Encoder
Memory
CPu
m
2
Tuner
IR
IR
T
7c
7b
7a
Optional

FIG. 16

PPLICATION FILED BY: 20 MOS., _____ OR 30 MOS., ____ SCREENED BY [redacted]
Vonda M. Wallace
Paralegal Specialist

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_ Article 19 amendments
_ Priority Document(s) No.___
_ Request Form PCT/RO/101
_ PCT/IB/302
_ PCT/IB/304
_ PCT/IB/306
_ PCT/IB/308
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____ second submission_____
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____ type _____
____ Oath/Declaration (date submitted_____)
___ Not executed
____ Executed
____ Power of Attorney
____ Change of Address

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Acceptable oath/declaration received_____
e) Date_____
complete 35 USC 371 requirements met_____

DATE NOTICE COMPLETED

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O 905 Notice of Missing Requirements_____
O 917 Notice of A defective oath or declaration_____
O 916 Notice of defective response_____
O 913 Notice of defective translation_____
O 909 Notifiication of Abandonment_____

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)

☐ Declaration Submitted with Initial Filing OR ☒ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

Attorney Docket Number	ROY-007
First Named Inventor	AUSTIN, Kenneth
COMPLETE IF KNOWN	
Application Number	09/601,712
Filing Date	
Group Art Unit	
Examiner Name	

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

VIDEO MEDIA CONTROL SYSTEM

(Title of the Invention)

the specification of which
☐ is attached hereto
OR
☒ was filed on (MM/DD/YYYY) 07/20/1998 as United States Application Number or PCT International Application Number PCT/GB98/02166 and was amended on (MM/DD/YYYY) _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached? YES	NO
9802415.1	GB	02/05/1998	☐	☐	☒
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

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DECLARATION — Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (If applicable)

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As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number [ ] → Place Customer Number Bar Code Label here
OR
☐ Registered practitioner(s) name/registration number listed below

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Dolores T. Kenney	31,269	Talivaldis Cepuritis	20,818
Seymour Rothstein	19,369	Daniel J. Deneufbourg	33,675

☒ Additional registered practitioner(s) named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

Direct all correspondence to: ☐ Customer Number or Bar Code Label [ ] OR ☒ Correspondence address below

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Address	20 NORTH WACKER DRIVE, 36TH FLOOR				
City	CHICAGO	State	IL	ZIP	60606
Country	US	Telephone	(312) 580-1180	Fax	(312) 580-1189

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Name of Sole or First Inventor: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	Family Name or Surname
Kenneth	AUSTIN

Inventor's Signature	[signature]					Date	15/9/00
Residence: City		State		Country	GB	Citizenship	GB
Post Office Address	Weaverham Grange, 7 Beechwood Avenue, Hartford						
Post Office Address	Northwich, Cheshire CW8 3AR, United Kingdom						
City	Hartford	State	GB	ZIP	CW8 3 AR	Country	GB

☐ Additional inventors are being named on the ___ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

DECLARATION	REGISTERED PRACTITIONER INFORMATION (Supplemental Sheet)

Name	Reg. No.	Name	Reg. No.
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Joseph M. Kuo	38,943		
Martin J. Corn	35,847		
Richard L. Richardson	31,415		
David A. Gottardo	P-46,736		

09/529,013 09/29/2000